

## **CLAIMS**

What is claimed is:

1. A golf club comprising an elongated shaft, a club head at one end of the shaft having a face, a heel portion, a toe portion and a sole portion;  
a lie angle configured to maintain the impact point of a golf ball on the club face when the impact point is offset from the center of mass, said lie angle being the angle subtended by the axis of the shaft and a horizontal plane tangent to the sole of the club at the point where a vertical line through the club head center of gravity intersects said club head sole.

2. A driver or metal wood golf club having a club head with a heel portion and a toe portion at one terminal end of a shaft wherein said shaft centerline and a plane parallel to the ground and tangent to said club head sole form a lie angle when said club head is at rest and positioned to strike said golf ball;

the mass distribution said club head being concentrated at said toe and heel;

a club face on said club head operable for striking a golf ball and spanning the area between said heel and said toe of said club head and having a heel to toe bulge defined by a radius, NR, whose center is square to the face or offset towards said heel, radius OR, and whose arc is swept from heel to toe of said club face as described in Figure 13;

a lie angle configured to maintain the impact point of said golf ball on said club face when said impact point is off the center of mass, said lie angle which is the angle between the centerline of the shaft and a horizontal plane tangent to the sole of the club being greater than about 60°.

3. A driver golf club having a club head with a heel portion and a toe portion at one terminal end of a shaft wherein said shaft centerline and a plane parallel to the ground and tangent to said club head sole form a lie angle when said club head is at rest and positioned to strike said golf ball;

the mass distribution of said club head being concentrated at said toe and heel;

a club face on said club head operable for striking a golf ball and spanning the area between said heel and said toe of said club head and having a heel to toe bulge defined by a radius, NR, whose center is square to the face or offset towards said heel, radius OR, and whose arc is swept from heel to toe of said club face as described in Figure 2;

a lie angle configured to maintain the impact point of said golf ball on said club face when said impact point is off the center of mass said lie angle which is the angle between the centerline of the shaft and a horizontal plane tangent to the sole of the club being greater than about 60° and wherein the height of the clubface as measured from the top edge to the sole edge at its greatest point is greater than 47 mm (1.85 inches).

4. A driver golf club having a club head with a heel portion and a toe portion at one terminal end of a shaft wherein said shaft centerline and a plane parallel to the ground and tangent to said club head sole form a lie angle when said club head is at rest and positioned to strike said golf ball;

the mass distribution of said club head being concentrated at said toe and heel;

a club face on said club head operable for striking a golf ball and spanning the area between said heel and said toe of said club head and having a heel to toe and sole

to the top of club head bulge defined by a radius whose center is offset toward said heel and whose arc is swept from said heel to said toe of said club face;

a lie angle configured to maintain the impact point of said golf ball on said club face when said impact point is off the center of mass said lie angle which is the angle between the centerline of the shaft and a horizontal plane tangent to the sole of the club being greater than about 60°, the mass of the club head being concentrated in predetermined area and combined with said preferred lie angle provides an elliptical zone on the face of the club whose major axis is generally perpendicular to the shaft and wherein hits in the zone produce generally the same distance as hits at the center of impact.

5. A golf club metal wood or utility wood comprising a shaft having a gripping section at one end and a club head having a heel portion, and a toe portion attached to the shaft at the other end, the shaft centerline of said shaft and a horizontal plane parallel to the ground and tangent to said club head forming a lie angle when said club head is at rest, said horizontal plane being tangent to the said club head sole at a predetermined point where a vertical line through the club head center of gravity intersects the sole;

the mass distribution of said club head concentrated in the toe and the heel and the periphery of the head;

a club face on said club head operable for striking a golf ball and spanning the area between the said heel and said toe of said club head and having a heel to toe bulge defined by a radius whose center is square to the face or offset towards said heel, and whose arc is swept from heel to toe of said club face; and

a lie angle configured to maintain the impact point of said golf ball on said club face when said impact point is off the face center and located in the impact ellipse represented.

6. A golf club as claimed in Claim 5 said lie angle is greater than 60 degrees.

7. A golf club as claimed in Claim 6 wherein the length of the shaft measured from the heel end of the sole to the butt end is between about 39" and 48".

8. A golf club as claimed in Claim 6 wherein the height of the clubface as measured from the top edge to the sole edge at its greatest point is greater than 47mm (1.85 inches).

9. A golf club as claimed in Claim 6 wherein a line, Ttl, in Figure 2, tangent to the top edge of the clubface is tilted upwardly towards the toe at an angle greater than 2 degrees to the horizontal.

10. A golf club as claimed in Claim 5. wherein the mass distribution of the club head is concentrated in predetermined areas and combined with said preferred lie angle provides an elliptical zone on the face of the club, whose major axis is generally perpendicular to the shaft setup angle and wherein hits in the elliptical zone produce generally the same performance as hits at the center of impact on the face, the shaft setup angle 3 being the angle the club shaft makes to the horizontal as the golfer addresses the ball, and is determined by the length of the club shaft and the vertical height of the butt of the shaft as determined by the hand height of the golfer at setup.

11. A golf club as claimed in Claim 5 wherein the mass concentration is higher in the toe and lower in the heel to maximize the moment of inertia about an axis extending parallel to the setup angle plane and passing through the center of gravity of the club head.

12. A golf club as claimed in Claim 5 with a clubface designed with a thickness distribution so as to optimize the hit performance in the said elliptical hit zone.